

Herbaceous Wind Barriers (Acre) 422A

DEFINITION

Herbaceous vegetation established in rows or narrow strips across the prevailing wind direction.

PURPOSES

This practice may be applied as part of a conservation management system to support one or more of the following:

- Reduce annual soil erosion from wind.
- Protect growing crops from damage by wind-borne soil particles.
- Manage snow to increase available plant moisture.
- Provide food and cover for wildlife.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to cropland, or other land where crops are grown.

This standard describes how to use and manage herbaceous wind barriers for the identified purpose. Criteria for the establishment of perennial herbaceous vegetation are in the 342 Critical Area Planting Standard of the Field Office Technical Guide (FOTG), or Plant Material Center fact sheets. Refer to MSU Extension Bulletin E-2107 Seeding Practices for Michigan Crops, or other accepted technical references for criteria to establish annual herbaceous vegetation.

CRITERIA

General Criteria Applicable To All Purposes Named Above

a. Vegetation

Barriers will consist of stiff, erect, perennial grasses and forbs or annual plants, growing or dead. Plant

materials shall be selected for the following characteristics:

- Adapted to the site.
- Easy to establish.
- Erect non-spreading growth habit.
- Resistant to lodging.
- Good leaf retention.
- Minimal competition with adjacent crops.
- Tolerance to deposition.
- Highly competitive with weeds.

Use vegetation adapted to the site that will accomplish the desired purpose. Preference shall be given to native species in order to reduce the introduction of invasive plant species; provide management of existing invasive species; and minimize the economic, ecological, and human health impacts that invasive species may cause. If native plant materials are not adaptable or proven effective for the planned use, then non-native species may be used. Refer to FOTG, Section I, Invasive Plant Species, for plant materials identified as invasive species.

b. Number of Rows

Barriers may consist of one row of plants, providing the required porosity can be achieved with a single row, and that the row contains no gaps.

Where two or more rows are required, the rows shall be spaced no more than 36 inches apart.

Barriers that are harvested need to be managed so that they are of sufficient height and condition to meet their intended purpose.

Any mowing or pruning should be scheduled after nesting season (July 15).

c. Protective Barrier

It is recommended that a strip of rye 12-15 feet wide be sown in the fall at the same spacing as the vegetative barrier. It can help prevent the barrier from being "buried" alive from wind erosion deposition during establishment. Also, crop residue, strawy manure, or cover crops can be substituted for a rye barrier to prevent barrier burial from wind erosion. All should be upwind of the barrier.

Annual barriers need to be re-established each year by planting at the recommended dates. For areas prone to soil erosion by wind, the annual barriers

need to achieve the minimum height to protect the crop during the critical erosion period.

Additional Criteria To Reduce Soil Erosion From Wind

a. Barrier Height

Barriers designed for this purpose shall have a minimum expected height of 1.5 feet during the wind erosion period for which the barriers are designed.

b. Barrier Porosity

Barriers established for this purpose shall be designed to achieve a porosity of 40-50 percent.

c. Barrier Direction and Spacing

When barrier direction deviates from perpendicular to the prevailing wind erosion direction, the spacing between barriers shall be correspondingly reduced.

The spacing between barriers shall be measured along the prevailing wind erosion direction during those periods when wind erosion is expected to occur. Spacing shall not exceed 10 times the expected height of the barrier plus additional width permitted by the soil loss tolerance (T); or other planned soil loss objective. For maximum spacing between barriers, orient them perpendicular to the prevailing wind erosion direction or the prevailing wind direction as applicable for the purpose.

The effective spacing between barriers shall be determined using current approved wind erosion prediction technology. Calculations shall account for the effects of other practices in the conservation management system.

Additional Criteria To Protect Growing Crops From Damage From Wind-Borne Soil Particles

a. Barrier Height

Barriers designed for this purpose shall have a minimum expected height of 2 feet during those periods when growing crops are susceptible to damage by blowing wind or wind-borne soil particles.

b. Barrier Porosity

Barriers established for this purpose shall be designed to achieve a porosity of 40-50 percent during the period when growing crops are to be protected.

c. Barrier Direction and Spacing

When barrier direction deviates from perpendicular to the prevailing wind erosion direction, the spacing between barriers shall be correspondingly reduced.

The spacing between barriers shall be measured along the prevailing wind erosion direction during those periods when sensitive crops are susceptible to damage by wind-borne soil particles. Spacing shall not exceed 10 times the expected height of the barrier plus additional width permitted by the crop tolerance to wind erosion* as specified in Table 1, Guidelines for Predicting Wind Erosion in Michigan, Section I, Erosion Prediction, FOTG, or other accepted technical references.

** Crop tolerance to wind erosion is the maximum rate of soil blowing that crop plants can tolerate without significant damage due to abrasion, burial, or desiccation. Some species may be more vulnerable at flowering rather than emergence.*

The spacing between barriers shall be determined using current approved wind erosion prediction technology to estimate wind erosion during specific crop stage periods. Calculations shall account for the affects of other practices in the conservation management system.

Additional Criteria To Manage Snow To Retain Additional Soil Moisture

a. Barrier Height

Barriers designed for this purpose shall have a minimum expected height of 1.5 feet during periods of expected snow cover.

b. Barrier Porosity

Barriers established for this purpose shall be designed to achieve a porosity of 60-75 percent during periods of expected snow cover. This porosity is best, as it helps to achieve more even distribution of snow within the barrier system.

c. Barrier Direction and Spacing

When barrier direction deviates from perpendicular to the prevailing wind direction, the spacing between barriers shall be correspondingly reduced.

The effective spacing shall be measured along the direction of prevailing winds during periods of expected snow cover. For uniform distribution of

drifting snow, spacing shall not exceed 12 times the expected height of the barrier.

Barrier spacing may be increased with residue management, cover crops, or other conservation practices that impact wind erodibility.

Additional Criteria To Provide Food and Cover For Wildlife

a. Vegetation

Barriers established for this purpose shall consist of plants that provide food and cover for the targeted wildlife species.

b. Barrier Width

Barriers established for this purpose shall consist of two or more rows a minimum of two feet apart.

c. Barrier Height

Barriers established for this purpose shall have a minimum (typically 18 inches) expected height that provides adequate cover for the targeted wildlife species.

d. Soil Trap Planting

An annual soil trap planting of rye, sorghum, or buckwheat 12-15 feet wide upwind and adjacent to the barrier will improve cover and extend barrier life. Leave a two-foot space between the annual and perennial barrier to prevent competition.

CONSIDERATIONS

Transport of wind-borne sediment and sediment-borne contaminants off-site are reduced by this practice when used in a resource management system.

Herbaceous wind barriers are more suitable than field windbreaks for use under center pivot irrigation systems due to height considerations. Windbreaks may be located outside the windward edge of the irrigation system.

Spacing between barriers may be adjusted, within the limits of the criteria above, to accommodate widths of farm equipment to minimize partial or incomplete passes.

Selection of plants for use in barriers should favor species or varieties tolerant to herbicides used on adjacent crops.

Plants which may be alternate hosts for pests injurious to adjacent crops should not be selected for use in barriers.

Selection of plant species less palatable to animals may reduce damage to barriers from grazing wildlife.

Cash flow and cost-benefit can be improved by using sweet corn or popcorn and harvesting the ears for profit. The stalks must be left standing to retain their purposed function.

Where water erosion from melting snow, accumulated within the barrier system, is a concern, the hazard can be reduced by implementing erosion control practices such as residue management. Where feasible, aligning barriers across the slope can enhance moisture infiltration and reduce erosion.

Where barriers are designed to enhance wildlife habitat, plant species diversity should be encouraged. Barriers that result in various heights of vegetation within the barrier will maximize wildlife use.

Some plants are damaged by blowing wind as well as by wind-borne soil particles. In such cases, the spacing between wind barriers may have to be reduced from that obtained using wind erosion prediction technology.

PLANS AND SPECIFICATIONS

Specifications for establishment and maintenance of this practice shall be prepared for each field or treatment unit according to the Criteria, Considerations, and Operation and Maintenance described in this standard.

Specifications shall be recorded using approved specification sheets, job sheets, and narrative statements in the conservation plan. National Herbaceous Wind Barriers 422A job sheet (4/97) is recommended to record site-specific specifications.

The Herbaceous Wind Barrier Plan will include the following information:

- Purpose
- Barrier Width
- Barrier Height
- Barrier Length
- Acres in Barrier Area
- Species/Cultivar by Barrier Number
- Site Preparation
- Planting Method
- Operation and Maintenance

OPERATION AND MAINTENANCE

Annual barriers shall be re-established each year by planting at recommended dates, leaving rows standing after crop harvest, or leaving standing strips when incorporating a cover crop into the soil.

After establishment, perennial barriers shall be fertilized at the same time and rate as adjacent field crops, or as needed by the barriers. Weeds shall be controlled with cultivation, mowing, chemicals, or other acceptable methods.

Harvest of hay or seed from perennial barriers, grazing, or mowing for weed control shall be managed to allow regrowth to the planned height before periods when wind erosion, crop damage, or drifting snow are expected to occur. Annual barriers may be grazed or harvested after critical periods have passed.

Wind-borne sediment accumulated in barriers shall be removed and distributed over the surface of the field. When accumulation reaches 6 inches, re-establish or relocate barriers as needed.

Barriers designed to enhance wildlife habitat should not be mowed or pruned unless their height or width exceeds that required to achieve the wildlife objective, and they become competitive with the adjoining land use. When mowing or pruning is necessary, it shall be done during the non-nesting season.

REFERENCES

Conservation Production Systems With and Without Grass Barriers in the Northern Great Plains, J. K. Aase and L. L. Reitz, Journal of Soil and Water Conservation, July-August 1989, Volume 44, Number 4.

Effectiveness of Grass Barriers for Reducing Wind Erosion, J. K. Aase, F. H. Siddoway, and A. L. Black, Journal of Soil and Water Conservation, July-August 1989, Volume 40, Number 4.

NRCS Core 4 Training Manual, Chapter 3g:
Herbaceous Wind Barriers.

NRCS Plant Materials Fact Sheet, Tall Wheatgrass (*Agropyron elongatum*) for Erosion Control in Indiana, Michigan, and Wisconsin, D. Carroll, Plant Materials Center, Bath, Michigan, February 18, 1982.

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TABLE 1 - SUITABLE PLANTS FOR HERBACEOUS WIND BARRIERS					
Plant Species	Seeding Rate Plants/Ac	Seeding Rate Pounds/Ac PLS	Established Plants/10 Ft. Row	Minimum Number of Rows For: Erosion Control : Snow Mgt. (40-50% porosity) : (60-75% porosity)	
Field Corn					
Twin Row (36" apart)	53,000		38	2	2
30" Rows	20,000		11	6	4
	25,000		14	5	3
	30,000		17	4	3
36" Rows	20,000		14	5	4
	25,000		17	4	3
	30,000		21	4	2
Sweet Corn					
Twin Row (36" apart)	56,000		30	2	2
30" Rows	31,000		18	5	4
	36,000		21	5	3
	41,000		24	4	3
36" Rows	31,000		21	5	3
	36,000		25	4	3
	41,000		28	4	2
Popcorn					
Twin Row (36" apart)	56,000		30	2	2
30" Rows	13,000		8	15	9
	18,000		10	11	7
	23,000		13	8	6
36" Rows	13,000		9	12	8
	18,000		12	9	6
	23,000		16	7	5
Pearl Millet					
7" Rows		4	46	11	6
		5	57	9	5
		6	68	8	4
30" Rows		4	195	3	2
		5	244	2	1
		6	293	2	1
36" Rows		4	234	2	1
		5	293	2	1
		6	351	2	1

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TABLE 1 - SUITABLE PLANTS FOR HERBACEOUS WIND BARRIERS - Continued					
Plant Species	Seeding Rate Plants/Ac	Seeding Rate Pounds/Ac PLS	Established Plants/10 Ft. Row	Minimum Number of Rows For: Erosion Control : Snow Mgt. (40-50% porosity) : (60-75% porosity)	
Sorghum					
7" Rows	300,000	20	40	3	2
	375,000	25	50	3	2
	450,000	30	60	2	1
30" Rows	75,000	5	43	3	2
	150,000	10	86	2	1
	225,000	15	129	1	1
36" Rows	75,000	5	52	3	2
	150,000	10	103	1	1
	225,000	15	155	1	1
Sudangrass					
7" Rows	220,000	4	30	15	9
	275,000	5	37	12	7
	330,000	6	44	10	6
30" Rows	220,000	4	126	4	2
	275,000	5	158	3	2
	330,000	6	189	2	1
Sunflower					
30" Rows	17,000		10	12	8
	22,000		13	19	6
	27,000		16	8	5
36" Rows	17,000		12	10	7
	22,000		15	8	5
	27,000		19	6	4
Tall Wheatgrass (Jose)					
(6" Rows)		15	136	4	2
		20	181	3	2
		25	227	2	2
*Switchgrass					
(6" Rows)		3	134	4	2
		4	179	3	2
		5	223	2	2
*Big Bluestem					
(6" Rows)		7	132	4	2
		9	170	3	2
		11	208	2	2
Mischanthus spp.					
(6" Rows)		Plug	136	4	2
			179	3	2
			208	2	2

* Native species. Big Bluestem will require a fluffy seed drill or debarbed seed.